PicoLAS

FOCUSSING POWER TO THE POINT

# User Manual

Rev. 13.12

## LDS-VRM-005

## - preliminary Manual -


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**Distribution**

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## How to use the Manual

Remark: The LDS-VRM-005 described in this manual is a base-plate cooled laser diode driver.

Base plate cooling: Depending on the final application and operation regime, this unit may stay uncooled or must be assembled onto a heat sink.

Please refer to chapter Power dissipation for more details about the thermal power losses during operation.

You me use a passively or an actively air/water cooled device.

Housing: All units are delivered with housing. Changes are possible; the units can be delivered without housing upon request.

Before powering on your unit, read this manual thoroughly and make sure your understood it fully.

Please pay attention to all safety warnings.

If you have any doubt or suggestion, please do not hesitate to contact us!

## Absolute Maximum Ratings (destroying limits)

- All Input Pins must not exceed the voltage range below zero (GND) and beyond VCC
- VCC Limit: Refer to table in chapter "Power Supply (#3)"
- Peak output current: 0.5 A
- Max Imon current: 10mA
- Operating temperature range: + 0 °C .. + 60 °C
- Best performance operating temperature range: + 10 °C .. + 35 °C
- Storage temperature range: - 20 °C .. + 70 °C

## *Dos and Don’ts*

Never ground any output connector.

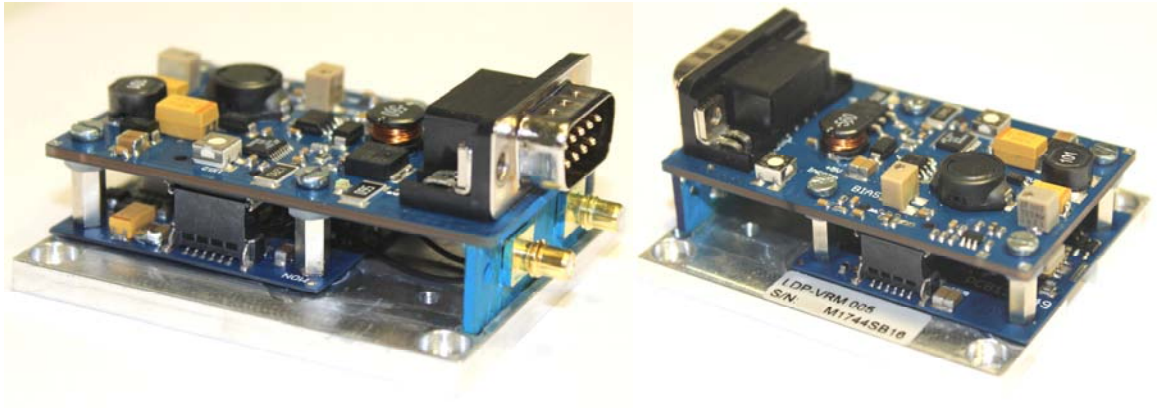
Never use any grounded probes at the output.
Do not connect your oscilloscope to the output!
This will immediately destroy the driver and the probe!

Keep connecting cables between power supply and driver as well as the connection between driver and laser diode as short as possible.

Mount the driver on an appropriate heat sink!

Please be aware that there might be hot surfaces, be careful not to touch them!

# How to get started



You need an additional fast arbitrary waveform generator (AWG) which has to be connected to the Input MMCX-Terminal. There is no AWG on board of the driver!

The PCB is very thin. Mechanical forced have to be avoided to prevent damage. Mechanical damages are not covered by warranty.

| Step # | What to do | Check |
|---|---|---|
| 1 | Assemble the driver onto an appropriate heat sink | |
| 2 | Solder a dummy-diode between LD+ and LD-pad, alternatively make a short circuit there. | Refer to Chapter “Test Load” |
| 3 | Connect GND, +15V Vcc (Power Supply disabled). | Required current for this step is around 18 mA |
| 4 | Connect AWG or pulse generator on Input Terminal (no pulse before power supply enabled). | Refer to all chapters referencing Input (Connector #1) |
| 5 | Enable the power source for +15V Vcc and feed a Pulse on the input terminal. For example 0.5 V amplitude 1 µs pulse width and 300 µs repetition rate. | Make sure not to overload the laser diode or the driver. |
| 6 | Check it whether the Current Monitor Output pulses shape is similar to the input signal. | On Imon-Output (Connector #2) you can measure a signal comparable with the input signal. 1.0 V on the input terminal results a current of 500 mA by test-diode or bypass and 400 mV on the Imon-Output. Use an oscilloscope with a 50 ohm termination. |
| 7 | Disable the input signal and turn the power sources for +15V Vcc. Take out the test-diode or bypass. Assemble the final laser diode. | |
| 8 | Turn the power supply for the +15V Vcc on and feed a Pulse on the input terminal. | |

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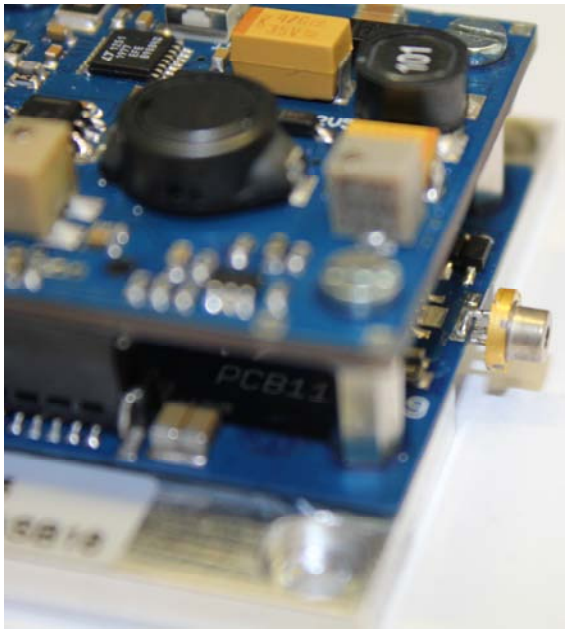
## Required Laser-Diode Pinout

The LDS-VRM-005 is designed for the direct connection of almost any kind of laser diode. The landing patterns accept 2 and 3 terminal packaged Laser-Diodes.

⚠ Never use cables > 10nH. This will cause excessive ringing and may damage the LD.




Laser Diode Connection: the rectangular Pads on top (Cathode) and bottom (Anode).
The dimensions of the rectangular Pads are 1 mm x 5 mm.
There is no optical feedback path. The unit is current controlled, only.

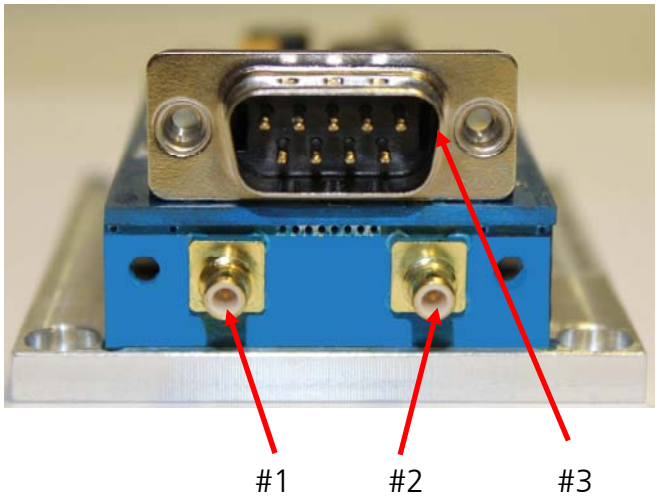
⚠ Please shorten the legs to avoid short circuits inside the driver

⚠ The maximum internal stray impedance must not exceed ~ 10 nH to achieve best performance

## Required electrical characteristics of the Laser-Diode:

| Parameter | Comment | min | typ | Max |
|---|---|---|---|---|
| Laser Diode Forward Voltage | Pulse mode | 0 V | 1.8 V | 6 V |
| Laser Diode Forward Voltage | CW mode 500 mA | 0 V | 1.8 V | 3 V |

# Description of the Connectors of the LDS-VRM 005

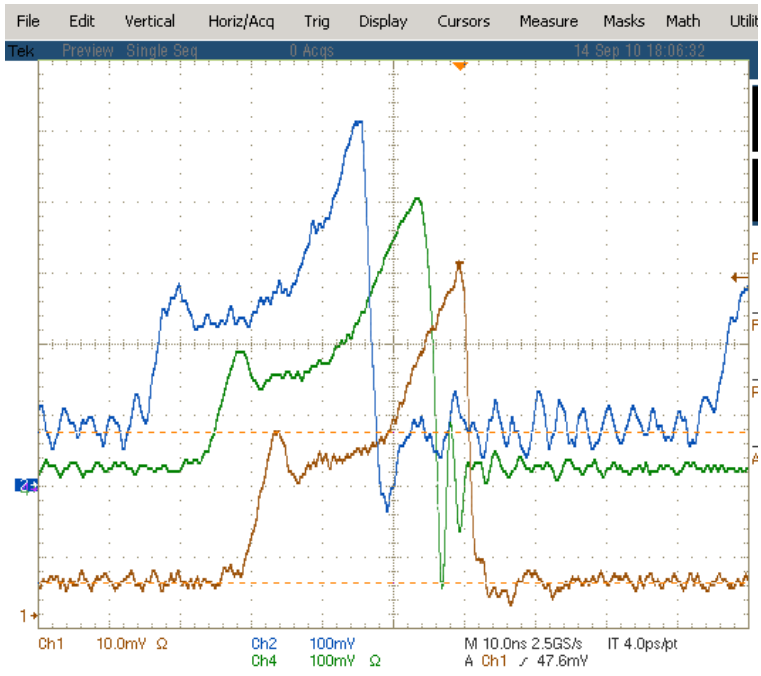



| Connector | Function | Assembled Type | You need: |
|---|---|---|---|
| #1 | Signal input | SMC, male MULTICOMP 1169655 | SMC, female |
| #2 | Current monitor (Output) | SMC, male MULTICOMP 1169655 | SMC, female |
| #3 | Power connector | D - Sub 9 male | D - SUB9 female on cable: Harting 0966118 7500 |

## *Input (#1) and Current Monitor (#2)*

The driving analogue signal is provided via Connector #1. The output current is following the input signal within the limitations (bandwidth, max. current, rise time) proportional (refer to Chapter "Linearity").

File Edit Vertical Horiz/Acq Trig Display Cursors Measure Masks Math
Tek Run Sample 23 Aug 10 10:50:12
Ch3 200mV Ch4 200mV Ω
M 40.0µs 5.0MS/s 200ns/pt
A Ch3 ⟋ 392mV


File Edit Vertical Horiz/Acq Trig Display Cursors Measure Masks Math
Tek Preview Single Seq 0 Acqs 14 Sep 10 18:06:32
Ch1 10.0mV Ω Ch2 100mV
Ch4 100mV Ω
M 10.0ns 2.5GS/s IT 4.0ps/pt
A Ch1 ⟋ 47.6mV

## Propagation delay (#1 to #2)

The typical propagation delay from input to start of current flow is typ. 10 ns. Additional 8 ns appear through the internal current monitor.

## Description of the SUB-D 9 Connector (#3)

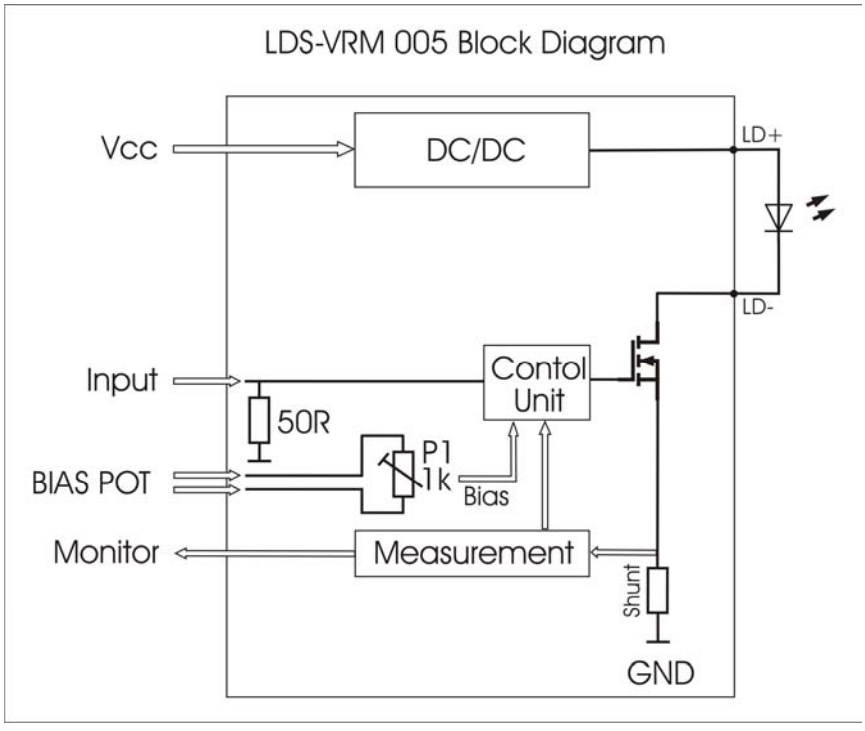
| Pin | SUB-D 9 Connector |
|---|---|
| 1 | GND |
| 2 | BIAS POT1_2 |
| 3 | BIAS POT1_1 |
| 4 | NC |
| 5 | NC |
| 6 | NC |
| 7 | 15V Vcc |
| 8 | GND |
| 9 | 15V Vcc |

## Power Supply (#3) and Supply Absolute Maximum Ratings

The laser driver supply can be interrupted at any time for e.g. safety reasons.

| Pin of conn. #3 | Allowed range | Best performance | Destroying limit |
|---|---|---|---|
| 7 and 9 (15V Vcc) | 15 V … 24 V | 15 V | 25 V |
| 1 and 8 (GND) | GND | GND | |

## Block Diagram



# *Description of BIAS POT (#3)*

## Bias Potentiometer P1

### P1 Bias

This Value of Potentiometer P1 is part of the calibration procedure performed at PicoLAS. It must not be changed by customer. Changes have an impact on the performance of the driver and may damage the LD and the driver. All changes are monitored and will cause the lost of the warranty.

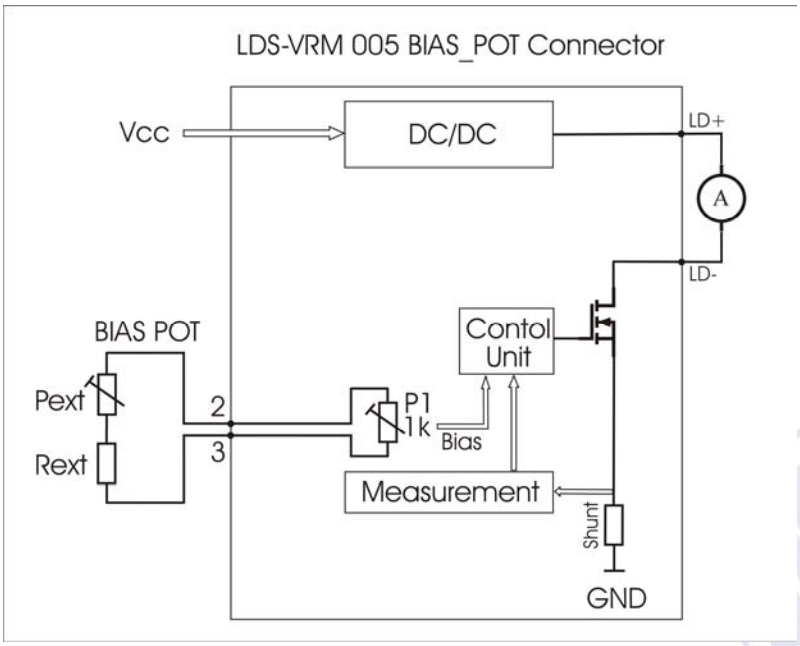
The factory settings provide the Bias current to 15 - 20mA. This current flows always through the laser diode.

## BIAS_POT Connector

To increase the Bias current, an additional resistor can be connected externally.
Resistance value on pin 2 and pin 3 of connector #3 sets the Bias current for the control unit.
Reduction of the total resistance results an increase of the Bias current.

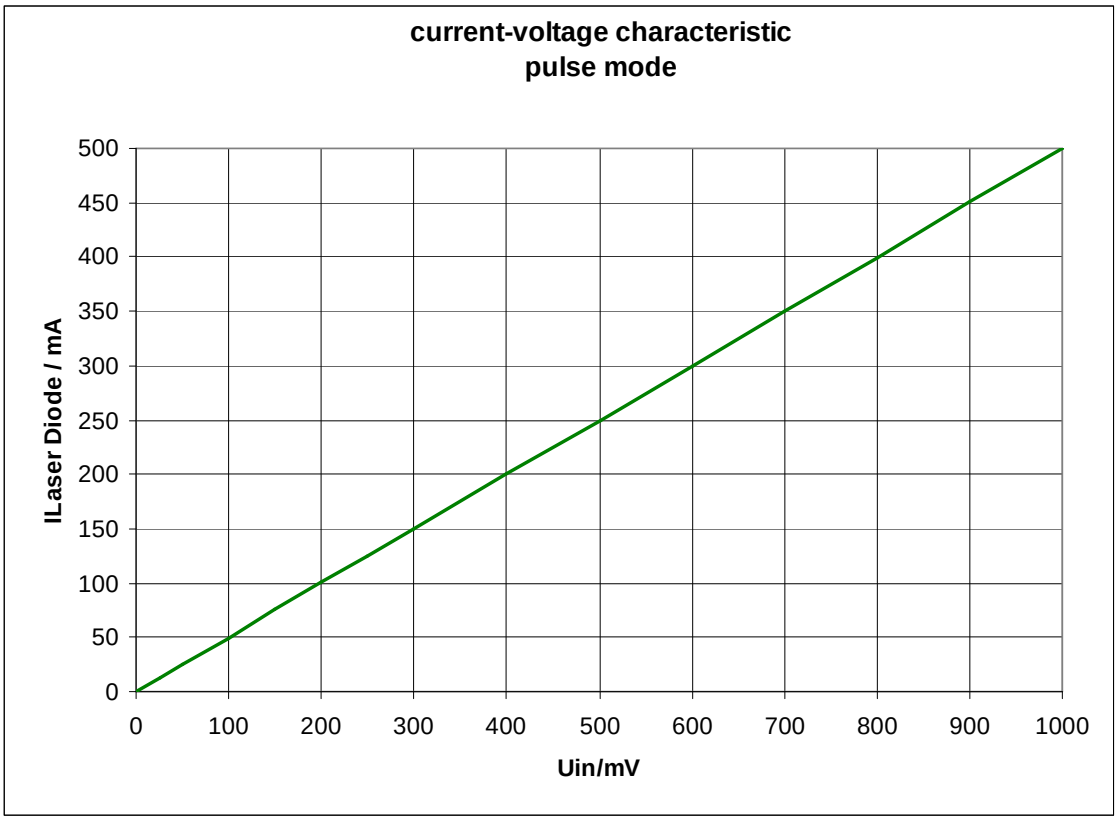
A short circuit between the Pin 2 and 3 would be increase the Bias current in level of 500 mA.

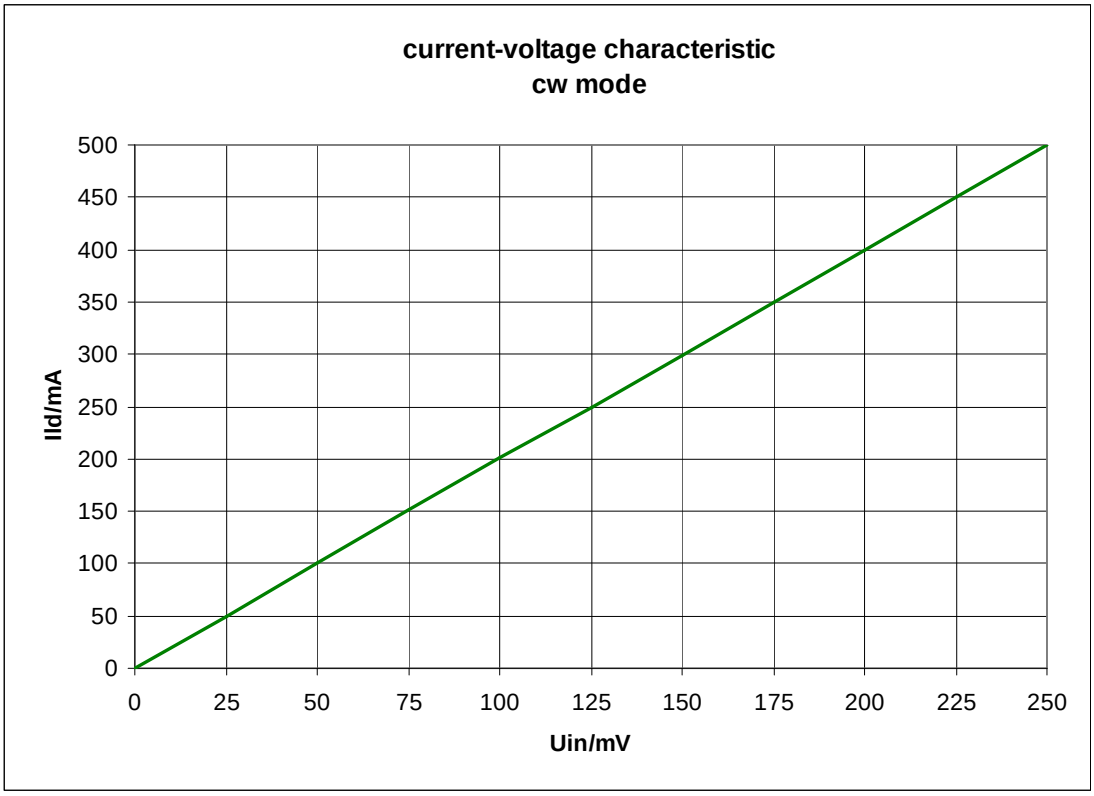
Use as example a resistor Rext and potentiometer Pext in series.
The resistor Rext set the maximum and Pext the minimum of Bias current.
Rext=1k for 150 mA Bias current.
There can not be set as the factory settings smaller Bias current of 15 - 20mA.



If the increase of Bias current is not necessary let the pin 2 and 3 floating.

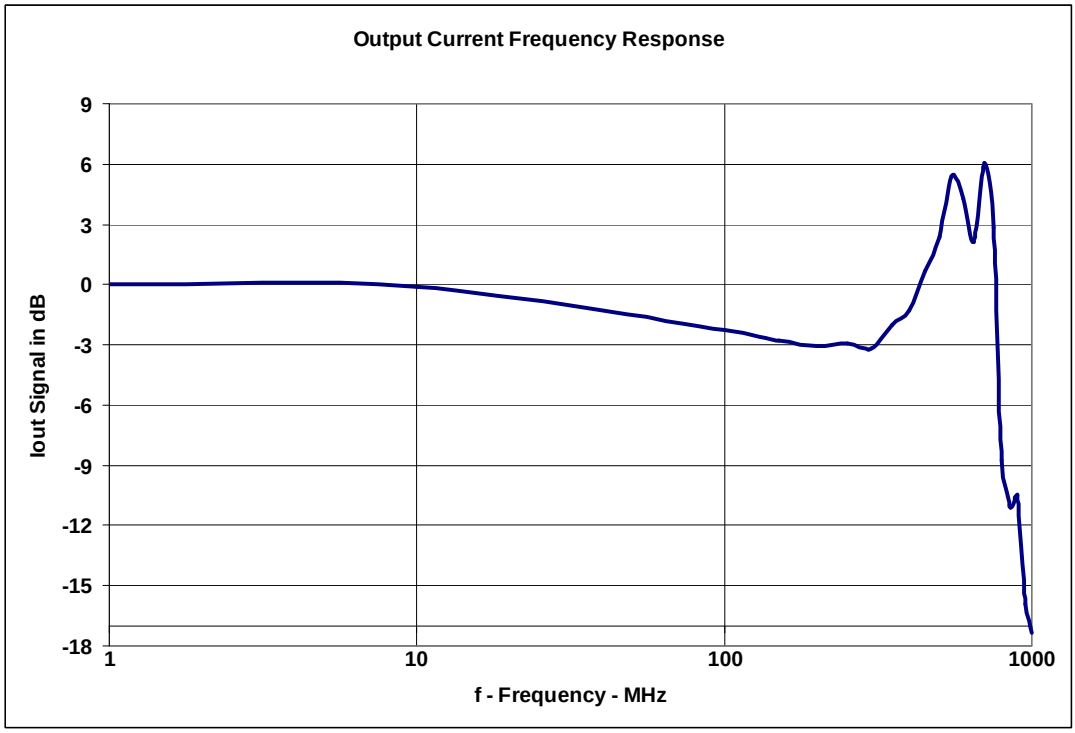
## *Linearity*

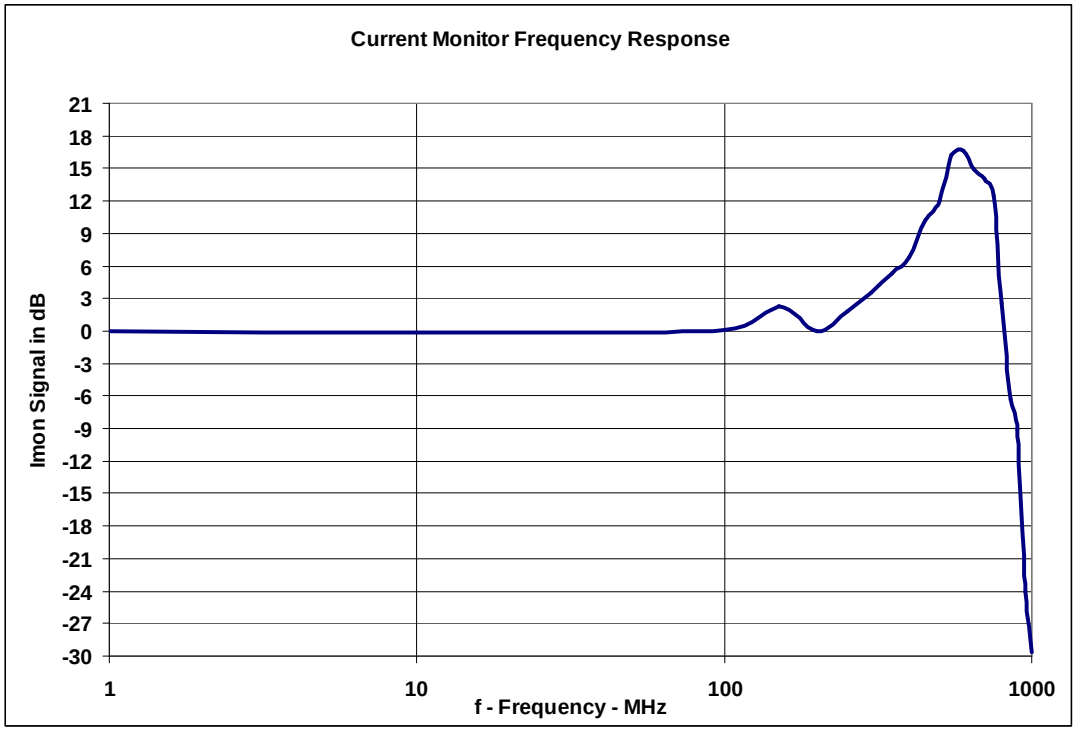



current-voltage characteristic
cw mode
Ild/mA
500
450
400
350
300
250
200
150
100
50
0
0
25
50
75
100
125
150
175
200
225
250
Uin/mV

## *Frequency Response*

Vcc = 15V, Output Current = 125 mA, Testload = short circiut .



## Cooling

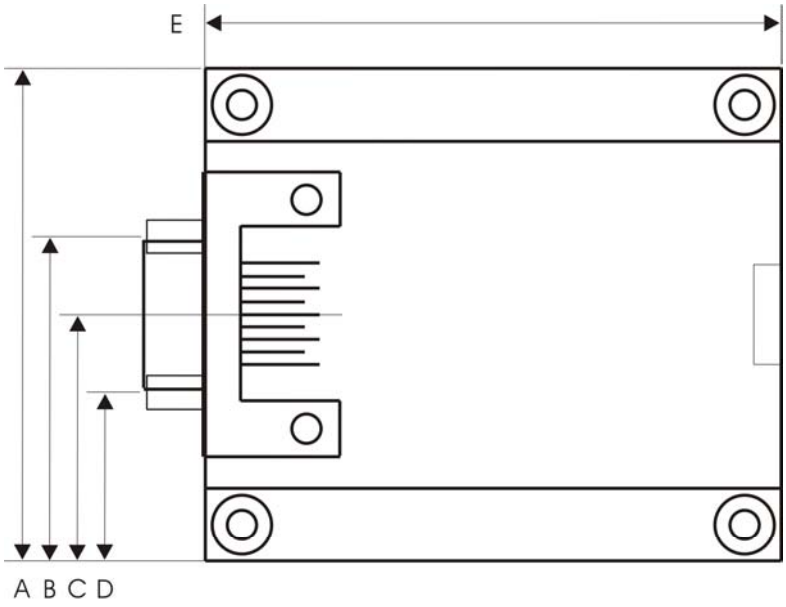
The seed driver is base plate cooled only. Please assemble the entire unit to a heatsink which is capable to take out the heat.
The heatsink is suitable, if the system temperature does not exceed the maximum operating limits. To achieve best performance the base plate temperature should be kept in the range of + 10 °C … + 35 °C.
The peak heat load is 10 W.

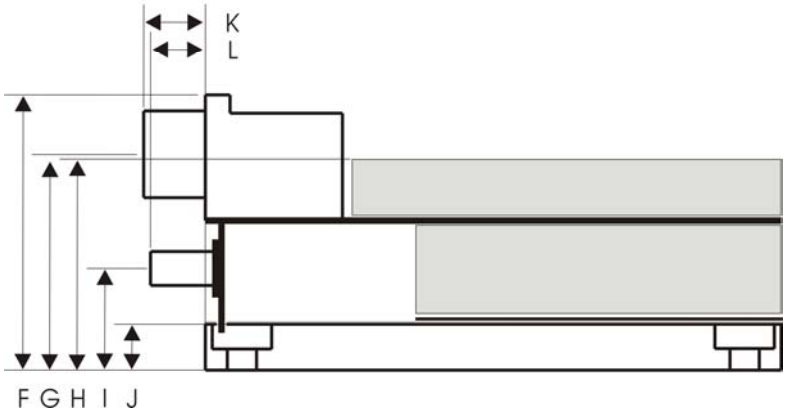
## Test Load

For the first testings a test load may be assembled instead of the laser diode. This test load may be a short circuit or a fast schottky diode like MBR0540. Please connect the test load only between Anode and Cathode (LD+ and LD-) and prevent shorts to any other part of the circuit.
The connections for LD+ are at the bottom and for LD- on the top side.

## *Mechanical Dimensions*

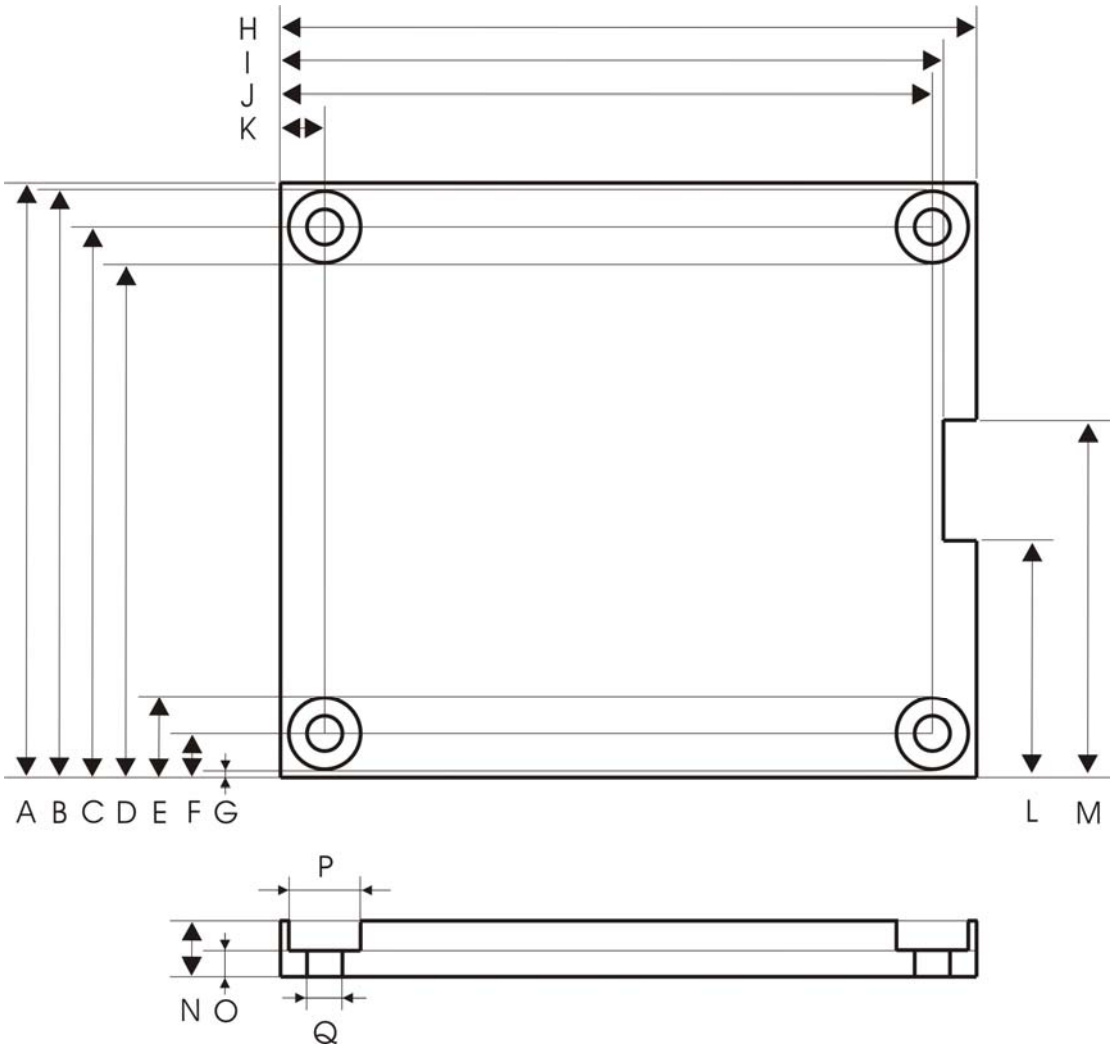
The following dimensions are in millimetres (mm).




| | |
|---|---|
| A | 54 |
| B | 35,5 |
| C | 27 |
| D | 18,5 |
| E | 63 |
| F | 30 |
| G | 23,5 |
| H | 23 |
| I | 11 |
| J | 5 |
| K | 6,7 |
| L | 6 |

The following dimensions are in millimetres (mm).




| | |
|---|---|
| A | 54 |
| B | 53,25 |
| C | 50 |
| D | 46,75 |
| E | 7,25 |
| F | 4 |
| G | 0,75 |
| H | 63 |
| I | 60 |
| J | 59 |
| K | 4 |
| L | 21,5 |
| M | 32,5 |
| N | 5 |

| | |
|---|---|
| O | 2,3 |
| P | 6,5 |
| Q | 2,3 |